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THESIS

SUCCESSFUL ACHIEVEMENT
of TQL
in DoN ACTIVITIES

by

Michael J. Craft

June 1993

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Successful Achievement
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by

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of the requirements for the degree of

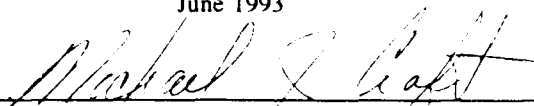
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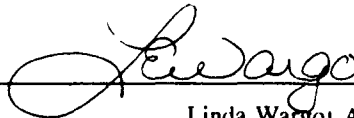


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ABSTRACT

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The primary objective of this thesis is to investigate the continued achievements and to identify any barriers to implementing Total Quality Leadership (TQL) in three Department of the Navy (DoN) organizations that had participated in Carolyn Applegate's thesis which was completed in September 1991. Phone interviews were conducted to gather data regarding to current status. Follow up interviews were also conducted on specific innovative practices noted by Carolyn Applegate in order to evaluate their current status. Additionally, a questionnaire was distributed throughout the activities. This questionnaire was used to determine the perceptions that employees had about their respective organizations with regards to each aspect of quality management.

Conclusions reached were that initial implementation of TQL at all three activities was successful and that ongoing refinements are being identified and implemented. Critical factors in successful implementation were top management commitment and involvement, extensive "top/down" training, innovative methods of expanding employee's roles through empowerment, self-managing teams, and joint teams.

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I. INTRODUCTION

A. BACKGROUND

The Executive Branch of Government and, in particular, the Department of Defense (DoD) has officially adopted Total Quality Management (TQM) as the philosophical and practical guiding principles by which it will manage resources in the 1990s and hence into the next century. (Carlucci, 1988) The Navy has also recognized the need to change its management philosophy to a structured approach to managing and improving the quality of service and administrative functions. This change is being accomplished primarily by adopting the principles and practices of TQM. The Navy and Marine Corps, however, refer to TQM as Total Quality Leadership (TQL) and it is acknowledged that implementing TQL successfully throughout the Navy will require top-to-bottom support over a number of years. (Grant and Flatau, 1993)

The philosophy of TQL is not new and much has been written about its evolution. (Kelso, 1990) TQL is based on the premise that all work can be defined as a process and any process can be improved. With changing technology and decreasing budgets, the need to examine different approaches to traditional management problems is ever increasing. A number of articles in *Contract Management*, *The Navy Supply*

Corps Newsletter, and Aviation Week & Space Technology regarding implementing TQL conclusively demonstrate that organizations within the Navy are embracing and implementing total quality programs with ever increasing enthusiasm.

TQM principles were first used in the industrial environment of the Navy's aviation depots in the early 1980s. In 1983, at the Naval Aviation Depot North Island, TQL tools were so effective that the number of defects in aircraft maintenance were reduced from four defects per aircraft to one in every four. (Henderson, 1991) Due to the effectiveness of these tools, TQL quickly spread throughout the aviation depot system and on to the rest of the Navy. To date, TQL guidelines have helped to ensure customer satisfaction and optimal use of resources, while improving performance. The Navy's operational TQL program dates from Admiral Kelso's arrival as Chief of Naval Operations in 1990 and the issuance of his memorandum to all Flag Officers stressing the unique and critical role of Navy leadership in developing and implementing operational objectives. (Kelso, 1990)

Unfortunately, some of the principles and philosophy of TQL contradict traditional government and military management approaches. (SECDEF, 1989) For example, traditional Government acquisition policy requires competition and award based on the lowest bid, when using sealed bidding, whereas TQL suggests that awards based on quality and performance are preferable. The contracting community continues to struggle

with the implementation of TQL in that it has not been able to integrate some of Deming's concepts by the direct application of TQL philosophy in the present acquisition world filled with its laws and regulations. (Davis, 1992) However, it makes good business sense to use total quality techniques to improve the entire acquisition process, and not just the final product as it goes out the door and into the hands of the customer.

Carolyn Applegate's (1991) thesis *Highlights of Total Quality Management in the Department of Defense: Lessons Learned, Quality Measurement and Innovative Practices* broadly looked at the implementation of TQM at ten DoD activities. Top executives at those activities were personally interviewed in order to elicit lessons learned. Also, each organization's executive steering committee participated in a survey to measure their perceptions of quality management at each organization. This resulted in a quantitative and qualitative analysis of the implementation of TQM at the activities studied.

Applegate's findings included identifying general implementation issues in the areas of strategic approach, resistance to change, commitment by top management, training and education, and performance evaluation. In addition, a number of innovative practices were revealed in the areas of self-managing work teams, training, recognition and reward systems, performance appraisal systems, and communications.

Little evidence was available at that time to evaluate the success or failure of these innovations.

B. OBJECTIVE

The objective of this thesis is to revisit and evaluate three Naval activities studied in the Applegate thesis (September 1991) and investigate the continued achievements and identify any barriers to implementing TQL. The thesis provides current status regarding general implementation issues as well as status of prior innovations and new innovations. Lessons learned during the process of TQL implementation can be documented and applied by activities just beginning the transformation and can enhance our understanding and further refinement of the developmental trends in the continuing implementation of TQL in the Navy.

C. RESEARCH QUESTION

1. Primary Research Question

What is the current status of implementation of TQL at three Naval activities identified in Carolyn Applegate's thesis?

2. Subsidiary Research Questions

a. To what extent have the benefits of TQM/TQL been realized and what factors have been critical to its success or failure?

b. What is the status of particular innovations that were outcomes of early TQL implementation as identified by Applegate?

c. Based on results of prior research, what are the key issues that must be addressed or resolved in achieving quality leadership?

D. SCOPE, LIMITATIONS AND ASSUMPTIONS

1 Scope

This thesis is a continuation of academic and operational research into the achievements, innovations and barriers involved in TQL implementation. The scope will be limited to those Naval activities with substantial procurement functions and where TQL has proven to be a major factor in reducing costs of acquisition. Background research will concentrate on those authors recognized by the Navy as the leading visionaries and authorities in the field of Total Quality Leadership.

2. Limitations

This study of lessons learned in the continuing implementation of TQL has three limiting factors. First, of the ten DoD organizations that were targeted in Carolyn Applegate's thesis only three were Naval organizations with significant procurement functions and which reflected major cost reductions as a result of implementing TQL. Second, while telephone interviews provide in-depth information

personal reflections and perceptions, they may have limited reliability due to the narrow range of sources. Finally, only 20 surveys were sent to each activity under study. The surveys were distributed to employees selected by the points of contact and thus cannot be considered as random.

3. Assumptions

This thesis assumes a basic knowledge and understanding of TQL concepts. The reader should be able to adapt the information presented to meet their own implementation and/or research needs. While it is not intended to be a "cookbook," this thesis will hopefully provide valuable information and insights for those implementing and/or conducting research in TQL.

E. ORGANIZATION OF THE THESIS

This thesis is divided into six chapters. Chapter I provides an introduction presenting background information on TQL and the Navy, the overall objective, and the research questions. Chapter II contains a literature review on the concepts of TQM that relate to the eight factors of Quality Management as described by Saraph, Benson, and Schroeder. (1989) Chapter III details the methodology with regard to research strategy, choice of organizations, interviews, and survey. Chapter IV discusses research findings from the interviews and survey questionnaire. Chapter V is the analysis of the interviews and survey based on the findings.

Chapter VI contains the researcher's conclusions and recommendations for future study.

II. LITERATURE REVIEW

A. INTRODUCTION

A literature search was conducted through the Defense Logistics Studies Information Exchange (DLSIE) and the local library at the Naval Postgraduate School to enlighten the author on the basic concepts and principles of TQM/TQL. Additional literature was obtained from various courses of instruction.

The genesis of TQL comes primarily from the teachings of Dr. W. Edwards Deming, Dr. Joseph Juran, Dr. Armand Feigenbaum and others. The enormous benefits of applying this philosophy are most strongly exemplified by the phenomenal success of the Japanese manufacturing industry in the global market. Readers are referred to Deming's *Out of Crisis*, and Juran's *Juran on Leadership for Quality*, for a detailed discussion of the history of quality management. Specific guidance for DoD personnel and organizations can be found in the *Total Quality Management Guide*, a two volume guide, issued in February 1990.

In an attempt to place a quantitative measurement on quality management, Saraph, Benson, and Schroeder developed an assessment model that identified eight critical factors. (Saraph et al, 1989) The eight critical factors consist of (1) the role of top management and quality policy, (2) the

role of the quality department, (3) education and training, (4) product/ service design, (5) supplier quality management, (6) process management/operating procedures, (7) quality data and reporting, and (8) employee relations. These eight critical factors will be used to organize the literature review below and will also be used as a framework for analyzing the data gathered from the three organizations participating in this study.

Along with these critical factors, a ninth factor has been added for the purpose of writing this thesis. A fundamental concept of most of the TQL literature is customer satisfaction. However, this critical dimension is not an explicit component of the Saraph, Benson, and Schroeder model. In addition, as shown by the Applegate thesis, organizations appear to lag in this aspect when implementing TQL. (Applegate, 1991) Applegate also recommends the need for adding a customer relations or satisfaction factor to the eight listed above to be consistent not only with the TQL literature, but also the criteria used by the Malcolm Baldrige National Quality Award.

B. THE ROLE OF MANAGEMENT LEADERSHIP AND QUALITY PROCESS

Top management must clearly demonstrate a strong commitment to the implementation of TQL for it to become a success. Charles N. Weaver proposes that managers must convince subordinates that they are sincere about improving

the way business is conducted. (Weaver, 1991) Good leaders give their employees a feeling of being an integral, important part of the family (team).

When reading literature on Total Quality, one quickly becomes familiar with the name of Dr. W. Edwards Deming, an established pioneer in the field of total quality. His philosophy of a system of profound knowledge and "14 points" (Table I.) are critical to understanding his approach to total quality. Deming's management philosophy is aimed at long-term improvement and customer satisfaction through personal top management support and commitment to the continuous incremental improvement of process, products and services.

The DoN is using Deming's approach to TQL because he emphasizes leadership responsibilities and integrates process improvement methods with new methods for leading people. Deming urges the transformation of existing management styles and practices. "The job of management is not supervision, but leadership." (Deming, 1986)

J. M. Juran (1989), another recognized leader in the field of quality, advocates Strategic Quality Management (SQM), a systematic approach for setting and meeting quality goals throughout the company. (Juran, 1989) Leaders must be involved by establishing a vision for the future and setting specific quantifiable goals if implementation is to be successful. It is not enough for leaders to merely establish

Table I DR. W.E. DEMINGS'S "14 POINTS"

Deming's "14 Points"

1. Create and publish to all employees a statement of the aims and purpose of the company or other organizations. The management must demonstrate constantly their commitment to this statement.
2. Learn the new philosophy, top management and everybody.
3. Understand the purpose of inspection, for improvement of process and reduction of cost.
4. End the practice of awarding business on the basis of price tag alone.
5. Improve constantly and forever the system of production and service.
6. Institute training (for skills).
7. Teach and institute leadership.
8. Drive out fear, Create trust, Create a climate for innovation.
9. Optimize towards the aims and purpose of the company, the efforts of teams, groups, staff areas, too.
10. Eliminate exhortations, for the work force.
11. a. Eliminate numerical quotas for production. Instead, learn and institute methods for improvement.
b. Eliminate M.B.O. (management by objective). Instead, learn the capabilities of processes, and how to improve them.
12. Remove barriers that rob people of pride of workmanship.
13. Encourage education and self-improvement for everyone.
14. Take action to accomplish the transformation.

(The Deming Library, Vol. XVI, 1989)

policies, create awareness, and then leave all else to subordinates. (Juran, 1989)

C. THE ROLE OF THE QUALITY DEPARTMENT

The role of the Quality Department is changing. Deming claims it is unfortunate that Quality Control Departments have taken the job of quality away from the people who can contribute most to quality - management, supervisors, purchasing managers, and production workers. (Deming, 1986)

In addition, inspecting for quality at the end of the process does nothing to correct the problem. (Juran, 1989) Quality Departments, wielding figures that show what happened in the past - not what will happen in the future, which they cannot predict - often mystify managers to the point where they feel no responsibility for quality, but instead leave the responsibility in the Quality Department's hands. (Walton, 1986)

Instead of providing management with hindsight, Quality Departments need to teach those responsible for a process how to chart the results to show whether the system has reached a stable state. (Deming, 1986) Quality Departments need to train all employees in quality-oriented concepts, methods, tools, and techniques. Juran (1981) states that, as Western ideals change, Quality Departments will become smaller and perform a limited array of functions such as, broad planning and auditing, and consulting services.

In trying to better define the role of the Quality Department, The Defense Federal Acquisition Regulation Supplement (DFARS) provides uniform policies and procedures for DoD Quality Departments:

Departments and agencies shall -

(1) Develop and manage a cost effective quality program to ensure that contract performance conforms to specific requirements. Apply a quality program to all contracts for services and production designed, developed, purchased, stored, distributed, operated, maintained, disposed of by contract.

(2) Conduct quality audits to ensure that quality of products and services meet contractual requirements.

(3) Base the type and extent of Government contract quality assurance actions on the particular acquisition.

(4) Provide the customer the maximum flexibility in establishing efficient and effective quality programs to meet contractual requirements. (DFARS)

D. EDUCATION AND TRAINING

Education and training are essential to the implementation of TQL. Deming (1986) calls for the total reconstruction of training, the institution of a vigorous education program and self-improvement, and emphasizes that management needs to learn about the company from the incoming material to the customer. Training must involve learning new techniques that will bring employees and management to the same basic level of TQL knowledge. "What organizations need is not just good people; they need people who are improving with education." (Deming, 1986) Continuous self-improvement through education

and training are seen by many as the avenue to advancement. Both Deming (1986) and Juran (1989) advocate education and training as a continuous and ongoing process to provide the workers with the means to do a good job and to produce quality products.

Training in TQL philosophy should be required of the entire organization from top management to the newest, most junior employee. Once it is determined that universal training in managing for quality is essential to meeting the organization's quality goals, such training cannot be on a voluntary basis. (Juran, 1989) Managing quality will require breaking with traditional thinking and methods of training and education. Traditionally, training and education have been conducted during a phase or stage of life or as an event-related requirement. Training and education have had a beginning and an end point. In the future, managing for quality requires providing continuous training and education on the philosophy, methods and tools of TQL as well as the specific processes and tasks.

In addition, previous lessons learned mandates that TQL training must start at the top. (Lacson and Morgan, 1990) This allows leaders to make better, more informed decisions regarding total quality training for the rest of the organization. Top management will be able to act as trainers, when they are trained first, and will be able to customize training to their organization's needs. Also, top management

will set an example of sincere commitment for the rest of the organization to follow. They will be able to evaluate the work forces' grasp of TQL concepts, and be able to identify and provide additional training where required.

Dr. Deming (1986) stresses that if a process has not reached statistical control, further training will help. Statistical tools and techniques are necessary to determine if the process is in statistical control. The work force needs training in the applications of these tools and techniques so they can maintain a quality output and continuously improve their work processes.

Management also needs training in tools and techniques to help them better plan and manage. In his book, *The Memory Jogger Plus+*, Michael Brassard describes seven management and planning tools that can be used to help managers make better use of the non-quantifiable or verbal data they often must use to solve complex issues and to plan for the future.

E. PRODUCT/SERVICE DESIGN

An essential part of product development (i.e., providing the product features required to meet customer's needs) is product design. As used here, *product design* is the activity of defining the product features required to meet the customer's needs. (Juran, 1998, pp. 112)

Fully understanding the customers' requirements is a major part of product/service design. It requires communication between the customer and organization, as well as between the various departments within the organization. All concerned

need to share ideas and understand each other's needs. Deming (1986) and Juran (1989) both emphasize the importance of the coordination between all affected departments in a new product design. Without this coordination, quality becomes suspect; likelihood of product failure or rejection increases; and costs will increase due to rework.

Deming (1986) states that improvement of quality envelops the entire production/service line from incoming raw material to the final product or service delivered to the customer. Without the customer, there would be no need for the product. Quality should be focused foremost on the needs of the customer.

A total quality system for designing products or services based on customer demands, and involving all members of the supplying organization, is known as Quality Function Deployment (QFD). (King, 1989) QFD's basic approach is for a cross functional team to spend more time in early stages of product/service development: defining product better and thoroughly documenting the design process. This early effort and cooperation between designers and other responsible departments reduces the overall design time and virtually eliminate the need for redesign, especially on critical items.

F. SUPPLIER QUALITY MANAGEMENT

Walton (1986) and Deming (1986) maintain that a buyer will serve the organization best by developing a long-term relationship of loyalty and trust with fewer suppliers. The use of fewer suppliers will reduce "lot to lot" variation in incoming goods and service.

The organization needs to educate suppliers regarding their specific quality requirements. As the relationship develops and matures suppliers typically can reduce costly and/or time-consuming efforts which are not in the best interest of both organizations. Suppliers may then direct additional effort to the study of mutual problems that may further reduce costs. (Dobler et al., 1990) The end result is that the supplier's operation becomes an extension of the receiving organization's process. Many organizations involved in quality improvement limit purchases to those suppliers who have programs in place to assure the quality of their products. Deming (1986) advocates that suppliers should be selected on the basis of meaningful qualifications such as evidence of active involvement by their top management in quality improvements.

Deming proposes a new, evolutionary approach for purchasing departments. Procurement efforts should shift from lowest initial cost or low bid to consideration of lowest or lower total cost (Deming, 1986) This places a larger

responsibility on the purchasing department to look for quality products that have a reduced Life Cycle Cost (LCC).

Suppliers need to be involved early in the new product/service design, whereas they are often left out of this process. Juran (1989) claims that achieving a quality product requires precise communications with suppliers as well as with the customer. Good relations with suppliers will help when unexpected changes in demands for materials and specifications, or the need to cancel or modify existing material requirements occur.

G. PROCESS MANAGEMENT/OPERATING PROCEDURES

Process management ensures that the right tasks are identified and monitored for continuous improved performance. (MFMQ, 1992) Traditional views of an organization, or "stovepipes", as a collection of vertical functions does not accurately reflect the systems view of how work gets done. Process management requires taking a horizontal view of the organization. By identifying tasks that have a major effect on the process and monitoring them, data gathered can be used to make decisions (based on facts) for improving the process. Further, by mapping out the process, managers begin to see the organization as a system and not as a group of "stovepipes".

Saraph, Benson, and Schroeder's explanation of this critical factor tends to be misleading. They describe process management as follows:

Clarity of process ownership, boundaries, and steps. Less reliance on inspections. Use of statistical process control. Selective automation. Fool-proof design. Preventive maintenance. Employee self-inspection. Automated testing. (Saraph et al., 1989, pp. 818)

This description does not reflect the real premise behind process management. Opportunities for performance or process improvement often lie in the functional interfaces or the "white space" on the organizational chart. (Rummler and Brache, 1991) Process management helps make the "white spaces" visible, and can be used to fix broken processes, redesign existing processes, or design a new process. (Rummler and Brache, 1991)

One method to improve the input or output of a process is by using the Plan, Do, Check, Act (PDCA) cycle. Developed by Walter A. Shewhart, the idea was adopted in 1950 by Dr. Deming in one of his first meetings with the Japanese. It was immediately used as the Deming Cycle (or Plan-Do-Check-Act Cycle). (Brassard, 1989) This cycle provides the structured, disciplined approach to monitor processes on a routine basis. Michael Brassard describes each step of the PDCA Cycle as follows:

We **PLAN** what we want to accomplish over a period of time and what we are going to do to get there.

We **DO** something that furthers the goals and strategies developed in number one.

We **CHECK** the results of our actions to make sure there is a close fit between what we hoped to accomplish and what was actually achieved.

We **ACT** by making changes that are needed to more closely achieve the initial goals or by developing procedures to ensure continuance of those plans that were successful. (Brassard, 1989, pp. 1-2)

H. QUALITY DATA AND REPORTING

Measurement of processes, their inputs and outputs, is critical to successful quality management. In order to make informed decisions, it is important for workers and managers receive timely and accurate quality data at an acceptable cost. Process measurement provides real-time data that can be used to identify and correct problems before they occur. Juran, on data analysis, maintains:

Knowledge of whether individual units of production conform to quality goals is only part of a complete approach to quality control. Often such processes are essentially continuous and harbor certain inherent trends - for example, the ink gets progressively more faint, tools wear, the temperature rises. Knowledge of such trends can help the work force to secure early warning of quality problems ahead. (Juran, 1989 pp-275)

Merely collecting data, however, is not enough. The data must be analyzed to identify the potential for improvement. For instance, Crosby proposes that measurements should be displayed for all to see, since they provide visible proof of improvement and recognition of achievement. (Crosby, 1979)

The value of Statistical Process Control (SPC) was recognized by Dr. Kaoru Ishikawa. In his book, *Guide to Quality Control*, Dr. Ishikawa describes the purpose for collecting data and continuous process improvement.

The manufacturing procedure will be most effective if a proper evaluation is made, and on-the-job data are essential for making the proper evaluation. (Ishikawa, pp. 14)

The gathering of data and thrie subsequent analysis and evaluation is the foundation of SPC and continuous process improvement.

I. EMPLOYEE RELATIONS

A common statement made by senior officials in the DoN is that employees are an organization's most vital and valuable resource. This is consistent with Deming's (1986) view that employees should be encouraged to make suggestions and to take a relatively high degree of personal responsibility for overall effective performance of their process. This presents a challenge to supervisors and top management to create a working atmosphere free from fear of reprisal and which encourages employees to provide candid constructive feedback. Given the opportunity and freedom to express their opinions, employees will respond by performing to the best of their ability. One of Ishikawa's fundamental principles of successful management is for organizations to allow subordinates to make full use of their abilities. Specifically, he states that employees who are allowed to use their own initiative and try their own ideas represent a powerful asset. (Ishikawa, 1985)

Employees must also be recognized and thanked for their willingness to be made accountable, and for showing pride of ownership for the process under their control. Crosby, (1979) Juran, (1989) and Deming (1986) all emphasize recognition as a vital component to any quality program.

A new way of empowering the work force has been the development of the self-supervising teams. Teams are brought together for a few months or years to develop a new product or solve a particular problem, or in a few cases have become a permanent part of the work force. (Dumaine, 1990) The teams are often composed of a cross section of people with different skills who temporarily assume the role of middle management. Juran explains self-supervising teams in the following way:

Self-supervising teams. This is a form of job enlargement both horizontal and vertical. An added, significant feature is that the teams are largely self-supervising. The teams decide which workers are to perform which operations. The team also takes on multifunctions (material supply, tool maintenance, product test, record keeping, etc.). The need for quality planning is extensive, and the team participates actively in such planning. (The supervisor becomes a key customer whose needs must be discovered and met.) (Juran, 1989, pp. 292)

In summary, this type of work arrangement allows the group to cut through the "red tape" thus reducing time and cost. "That's because teams composed of people with different skills, from different parts of the company, can swoop around bureaucratic obstacles and break through walls separating different functions to get the job done." (Dumaine, 1990) The

personal satisfaction and enhanced self-esteem of the team members are an added motivational bonus.

J. CUSTOMER SATISFACTION

The customer is the focus of everything we do. We must be customer driven. The objective is to anticipate, meet and exceed customer wants and needs. This includes both the external and internal customers. (Betti, 1990, pp. 6&7)

Juran (1989) defines a customer as anyone who receives or is affected by the product. Juran also goes on to classify customers as external or internal. External customers are those outside the organization affected by the product, while internal customers are those who work inside the organization and who are involved with the product.

Dr. Deming emphasizes that the customer is the most important part of any production/service activity. The improvement of quality must be aimed at the needs of the consumer, present and future. (Deming, 1986) If the customer is not satisfied, you run the risk of business being taken elsewhere.

Organizations must pay attention to internal and external customer/supplier relationships. The organization must know and understand what the customer wants. This requires extensive communication and careful listening to determine how the customer actually uses the product/service and what specific benefits they hope to get from the product/service. Focus groups, market research, and even simulations of

customer's use of the product/service may be involved. (Juran, 1989).

Weaver claims that when customers, suppliers and target organization personnel meet in feedback meetings, they quickly develop a capacity to communicate, relate, learn and solve problems (Weaver, 1991) With feedback, the organization is better able to define the customer's real needs, and the customer can begin to appreciate the capability of the process or system to provide a quality product/service. This free flow of information between customers, suppliers and the providing organization is critical to creating a satisfied customer.

III. METHODOLOGY

A. RESEARCH STRATEGY

The strategy employed in order to answer the questions put forth by this thesis consists of a three phased approach: (1) extensive literature review, (2) research by interviewing selected personnel , and (3) a written survey distributed at each site by the organizations' TQL coordinators.

The first phase consisted of a literature search from multiple sources, including the Naval Postgraduate School library, Defense Logistics Studies Information Exchange (DLSIE), DoN regulations, previous theses, and current publications and periodicals to gain basic knowledge of TQM/TQL principles. Additional information was sought from the same sources on the implementation of TQM/TQL and barriers involved with its implementation.

The second phase involved face-to-face and phone interviews conducted to gain insight regarding the implementation of TQM/TQL at the three participating organizations. Questions addressed the status of general implementation, current achievements and the innovative practices reported in Carolyn Applegate's 1991 thesis. The interviews were designed to determine if lessons learned in Carolyn Applegate's thesis still apply. Top managers, as well

as other levels of management, were interviewed within each organization.

The third phase involved the distribution of a written survey (shown in Appendix A). The survey was chosen as a method of collecting current information directly from a variety of personnel in order to obtain their assessment rating of their respective organizations on the eight aspects of quality management. (Saraph et al., 1989)

B. CHOICE OF ORGANIZATIONS

This thesis concentrates on three of the DoN activities targeted in Carolyn Applegate's (1991) thesis. These three activities were identified as exemplary TQL organizations in 1991 on the basis of their selection as winners and finalists in DoD/Office of Management and Budget's (OMB) Productivity/Quality Improvement Prototype (QIP) award. The three organizations are of different sizes and perform a variety of different tasks; however, they were chosen because they all have a substantial contracting responsibility.

The Naval Air Warfare Center, Aircraft Division (NAWC-AD), located in Indianapolis, Indiana is a totally integrated engineering, acquisition, and manufacturing facility. Its specific mission is to conduct research, development, engineering, material acquisition, pilot and limited manufacturing, technical evaluations, depot maintenance, and integrated logistics support on assigned weapon systems.

The Naval Aviation Supply Office (ASO), located in Philadelphia, Pennsylvania provides aviation and weapon systems support to the Navy and Marine Corps. It controls the purchase, distribution and inventory of aircraft spare parts at Navy and Marine Corps shore stations and aircraft carriers world wide.

Fleet and Industrial Supply Center (FISC), located in San Diego, California was formerly the Naval Supply Center, San Diego. The goal of the new organization is to improve support to the Fleet and Industrial customers. Procurement, inventory management, hazardous material management and customer support are centralized under a single manager.

Initial contact was established with the TQL coordinator at each organization who acted as the point of contact (POC) (see Appendix B). All correspondence and interviews were first coordinated through each POC. Each POC also provided documentation of TQM/TQL implementation at their respective commands and provided technical and administrative support and assistance with this thesis.

C. INTERVIEWS

The interviews were conducted via telephone and face-to-face contact. Telephone interviews were conducted with a variety of sources, including Executive Officers, the Head of the Quality Office, and Director of Training. Also there were a number of interviews with Small Purchasing Agents,

Contracting Officers, supervisors and non-supervisors who provided their name and telephone numbers on the demographic section of the survey. All interviews were conducted on a non-attribution basis. A total of 42 interviews were conducted with five people from each site.

Interviews varied in length from 10 minutes to 30 minutes. Detailed notes were taken during the interviews and subsequently transcribed within a few hours after the interview's conclusion. In some cases, interviews were recorded with the aid of a tape recorder, but only after obtaining specific, expressed approval from the interviewee.

1. General TQL Implementation

Interviews were conducted to ascertain the status of general implementation of TQL at each of the DoN activities involved. At each command, key individuals were asked the following questions:

- How has the implementation of Total Quality Leadership changed over the last two years?
- What are the barriers you still are encountering with regard to TQL implementation?
- Has the structure of the organization changed?

2. Status of Innovations

Key individuals were also interviewed on the status of those innovations reported by Applegate. Additionally, interviews were obtained from others at various levels of management within the commands. The following represents the

type of questions asked concerning status of innovations reported by Applegate:

- How successful have self-managing work teams been? (NAWC, ASO)
- What type of recognition/award program do you have? (NAWC, ASO, FISC)
- What is the status of the Blue Ribbon Contractor program? (NAWC)
- How does your organization identify, measure and track results of quality efforts? (NAWC, ASO, FISC)
- Has your organization implemented any new innovations? (NAWC, ASO, FISC)

D. SURVEY QUESTIONNAIRE

The survey used in this study was Carolyn Applegate's 1991 questionnaire which she adapted from a private sector study by Saraph, Benson, and Schroeder (1989). A copy of the survey appears in Appendix A.

Saraph et al., in reviewing Juran, Deming, Ishikawa and other key contributors to total quality literature, determined that several different sets of organizational requirements or critical factors for quality management have been proposed. However, little guidance was found in the literature as to how one may assess overall quality management. The study by Saraph et al., developed and validated an instrument to measure the critical factors of quality management. A few questions were eliminated due to their potential ambiguity;

standard Naval terminology. The survey was reviewed by the Thesis Advisor before distribution.

A typical survey question is shown below. This format allowed participants to indicate their perceptions and assessments of the degree or extent of a given practice within their respective organization.

	<u>Extent or Degree of Current Practice IS</u>				
	Very Low	Low	Medium	High	Very High
Timeliness of quality data	1	2	3	4	5

Survey participants were asked to circle the number that best represented their perception and assessment of that particular question within their organization.

In March 1993, 60 surveys were distributed to three TQL activities within the Department of the Navy. The small number of surveys was the result of originally targeting only the contracting office. Surveys were mailed to the point of contact in each activity for further distribution throughout all levels of the organization. The survey centered around the eight factors of quality management discussed in Chapter II. The number of questions relative to each factor is noted in parenthesis:

- Role of top managers and quality policy (13)
- Role of quality department (5)
- Training (8)

- Product/service design (7)
- Supplier quality management (10)
- Process manager/operating procedures (12)
- Quality data and reporting (9)
- Employee relations (8)

With some minor changes, Carolyn Applegate's randomized response model was used. Questions were randomly distributed throughout the survey in order to reduce any response bias relative to a particular factor or group of factors.

A Statistical software program *Minitab* was used to compute the mean and standard deviation of each factor. Further a T-test was performed using a 5% significant level to determine if the eight Critical Factors were significantly different from each other.

IV. RESEARCH FINDINGS

A. GENERAL IMPLEMENTATION STATUS

1. Naval Air Warfare Center, Aircraft Division

Implementation of TQL began at the Naval Air Warfare Center - Aircraft Division, Indianapolis (NAWC-AD-I) in December, 1987. The major emphasis was on training. The Center invested a great deal of time and money in training senior level people as well as middle managers and lower levels in Deming's philosophy. TQL "buzz words" were not used in the early stages of implementation in order to make the concept less threatening. Instead, it was referred to as a continuous improvement process. The Center trained 2,500 employees or approximately 90% of the total work force. During a review of their achievements in 1991, the Center decided that the current organization itself was an impediment to any other improvement. As explained by a member of top management,

In the previous organization things were typically thrown over the fence from design to manufacturing. Manufacturing would claim an inability to produce the product in a suitable manner. Therefore, we have eliminated all that and are teamed up horizontally, in most cases. We have the ability to organize vertically in those instances when that form is more appropriate.

There was no way for the Center to further evolve into a process type organization, since the previous organization

consisted of eleven chimneys (stove pipes) each acting as separate empires. The Center determined the only way to eliminate the chimneys and foster teamwork was to tear them down and reorganize horizontally.

To provide better service to the customer the Center conducted a complete reorganization. A layer of management was removed, eliminating all supervisors and leaving only three levels remaining. This organizational change allowed greater emphasis on management support vice management control. Middle managers were removed from the traditional supervisory roles and converted to associates who were personally responsible and accountable for process improvements and developing people. In addition the Quality Department was dissolved and those individuals became members of cross functional teams involving both engineering design and manufacturing. Thus, the TQL experts at the Center (previously housed in the Quality Department) took their expertise with them directly into the work centers, empowering the employees to take responsibility for processes and improving them.

During the planning of the reorganization of the Naval Air Warfare Center, Indianapolis, the Center did not solicit inputs from the customer. The Center did however learn from its mistakes. They learned, for example, that it is very important to encourage the customer to "buy in" up front. Later, when the entire Naval Air Warfare Center, Aircraft

Division at Patuxent River was reorganized, the customer was fully involved.

In Indianapolis, the customer was brought into the new "Concept of Operations" as it was developed to guide the implementation of the reorganization and to fully integrate them with the Center's strategic goals. The "Concept of Operations" refers to the organization's Mission Statement and Master Plan. The idea of a planned reorganization was "market tested" with the customer several times throughout the process of deciding how NAWC-AD-I was going to operate.

Another area one interviewee felt could have been done better was the way the reorganization was implemented. The technical section of the organization stood up first, three months before the support functions, such as HRO, Comptroller, and MIS. There were problems with parts of the organization working under the old system and one part working under the new strategic plan.

The Center felt that they were very successful in getting the middle managers involved as a team to develop the "Concept of Operations" for the new organization. Top management wanted recommendations to come from middle level managers who were closer to the day-to-day operations of the process and who knew first hand how the process within the organization worked. Top management fully supported this team effort and empowered them to develop the organization's new "Concept of Operations".

NAWC-AD-I's current focus is in getting processes in place throughout the Center after the reorganization. In reviewing their processes, it was found that in some cases the same task was being performed in three different ways. A member of top management explained it this way:

Printed wiring boards in the plant were built three different ways. The boards still met specifications, but the process was different.

To maintain process control, it was first necessary to map out the process. The overall process includes several major phases: proposal development, design, manufacturing, logistic support, and finally shipping. All five of these phases need to be connected and coordinated in a systematic manner.

The Center found it difficult to get employees to map out their processes because of the training required to teach employees to "flow chart". Top management discovered that it was not difficult to map out the process, but it was difficult to determine the proper measurements to take. The Center is presently using approximately 30 measurements. They are exploring the reduction of those 30 to approximately 12. Remaining measurements will include information on customer satisfaction, cycle time, people indicators, quality of service or product, and costs. A member of top management explained, "A lot of the measurements we now take are nice numbers, but if you don't like the number you can't do anything about it." The Center now realizes that if a measurement can

not be used to improve the process, then there is no purpose in gathering and analyzing that particular measurement.

Top management continues to be personally involved with the implementation of TQL by talking to employees on a regular basis. These talks consist of answering questions and providing two-way communications with employees about TQL implementation, principles, and organizational goals. The Commanding Officer personally manned a booth during "Quality Month" where he was available to all hands to answer their questions and to talk about their concerns related to TQL. Another method used to convey the Center's focus on quality is a dedicated space in the command newspaper for articles on continuous improvement, TQL issues and activities. Additionally, information formerly disseminated via the Continuous Improvement Newspaper has been automated. Minutes from Executive Steering Committee and Quality Control Boards are sent out to all employees via computer network. Process improvement projects' working status, results and findings are also forwarded via the network to enable employees to become aware of the activity's actions and progress.

2. Aviation Supply Office

Total Quality Leadership (TQL) remains the number one priority and basic management philosophy at the Aviation Supply Office (ASO). Top executives remain very participative in the continued implementation of TQL by regularly walking

around to offer and receive suggestions and to learn about the latest status of Process Action Teams (PAT), employee involvement and other areas of concern. A strategic plan was published to confirm TQL as the basic management philosophy and establish six strategies to provide direction for employees. The strategies are as follows:

- Empowerment of the ASO work force
- Transform ASO Processes and Information Systems
- Convert Customer Requirements into Customer Support
- Integrate and Network Aviation Data
- Develop Innovative Support Techniques with Quality Vendors
- Build Operating Affordability

A Strategic Plans Quality Management Board was established around each strategy in 1991. These Boards are comprised of members from the ESC such as the Commanding Officer, Executive Officer, Acquisition Executives and Deputies and are tasked to champion the strategy and ensure its execution. A few of the quality and productivity improvement results that appeared in ASO's 1993 Presidential Award For Quality are as follows:

- The number of backorders have decreased from a high in 1989 of over 160,000 to less than 75,000 in 1992, a 53% improvement.
- The average age of backorders they held decreased 18%, from an average of 259 days to 213 days.
- Working more closely with suppliers ASO's Quality Deficiency Reports (QDR) have decreased over 70%.

Each employee received a copy of the strategic plan, along with other publications which communicated quality

information. Other avenues for TQL communications are the monthly "TQL News", command newspaper "The Glidepath", and "C.O.-Grams" (one page letter from the Commanding Officer). ESC minutes are distributed by Thursday from meetings of the previous Tuesday to all employees.

It was noted by one interviewee that top executives should have involved middle managers sooner in the implementation of TQL. ASO provided extensive training for top executives and workers but did not provide a similar level of training to middle managers. This resulted in pockets in the activity where TQL has not been effectively implemented.

ASO began their implementation efforts by training employees in the Deming method. A major investment was made in training dollars and ASO's overall expenditures for training have doubled. Training hours have also increased to over 80 hours of training required per employee per year. Training was initially accomplished by using outside consultants. During the initial implementation of TQL, ASO's strategy was to develop a train-the-trainer concept using their own in-house instructors to teach tools and techniques to continue the training. As the work force became more versed in TQL concepts, training shifted from orientation to specialized and advanced courses like TQL applications, flow charting, and statistical process control (SPC). While taking part in classes in statistical process control techniques, the students noted their own lack of mathematical skills. The

Learning Center quickly developed a basic Math course to allow employees to prepare themselves for the SPC. This basic Math course was so popular that other basic courses in English, Writing, Grammar, Statistics, Management and ADP are now being taught. The Learning Center now has over two hundred programs, not counting videos.

The "Unsung Hero", "You Make a Difference", and Recognition Day have all become institutionalized. Developed by a Process Action Team (PAT), which was chartered to study the old recognition system, these terms are used as part of the organization's everyday language. Further discussion on ASO's recognition, award, and appraisal system is contained in section B.2.a. of this chapter.

Early resistance to TQL implementation was in the form of "its just another program, it will go away". By empowering the work force, ASO has managed to turn this attitude around. One approach to enhancing employee empowerment was to identify decision making roles and functions that can be made at the lowest level possible and pass that responsibility on to the employee. Examples of decisions that have been moved to lower levels are ordering supplies, setting agendas and releasing messages.

One interviewee expressed frustration with top executives. After participating in a process action team and coming up with several recommendations, none of them were acted on by the organization. He felt it was all just "lip

service"; that top executives were going to do what they wanted to do no matter what.

3. FISC, San Diego

Senior management at the Fleet Industrial Supply Center (FISC) San Diego recognize the need for their commitment as imperative for an effective TQL program. The Center's senior management had already assessed the need for fundamental changes in their organization in October 1991 and were beginning to approach reorganization in a total quality manner. Employees were involved up front with examining what their future was. With downsizing, decreased Defense Budgets, and the Defense Management Reorganization (DMR), the Center in April 1992 quickly took the lead and established the prototype for what became the Fleet and Industrial Supply Center (FISC) for all Naval Supply Centers to follow.

The major drive for this new concept was improved support for the fleet and industrial customers. Prior to the FISC concept, customers were required to interface with a number of the Supply Center's departments, Naval Support Activities, and organizations for logistics support. Today, the FISC acts as a single point of contact, eliminating the need for customers to contact multiple organizations for their needs.

The restructuring of the Naval Supply Center to the Fleet Industrial Supply Center created a significant challenge

in bringing resources to bear to meet customers' needs. To solve this, FISC supply support personnel were moved to the centers of force concentration (Aviation, Submarine, and Industrial) in San Diego in order to provide better customer support. The first of these sites opened in North Island in July 1992.

The depth of understanding and commitment to TQL principles has evolved further as Center personnel have learned more and have improved on many of the original concepts. This new understanding has caused FISC, San Diego to focus on external customer needs rather than solely focusing on improving those processes addressed at internal customers needs. The focus on external customers and their needs is allowing more input at all levels of the organization.

One of the challenges faced in implementing TQL at FISC was the inadequate monitoring of teams. PAT teams were being formed by the workers, instead of the QMBs, to fix anything they could find. There was no official charter or link pin to a QMB. A monitoring process was established putting the QMB's back in control. A link pin from the QMB was assigned to each PAT team along with a written charter setting the time frame and details of the PAT team's responsibilities.

Another challenge is the constant change of mid-level and senior management (mostly due to the rotation of military

officers every two to three years) could set back the whole implementation program if incoming personnel have not been properly trained in the DoN's TQL program. Additionally, these individuals will ultimately become the trainers of TQL at the organization in the future.

B. INNOVATIONS

Prior innovations were all identified by research from Carolyn Applegate's thesis. Respondents were asked to describe the current status of those innovations, as well as to report on any new innovations that have resulted from continued TQL implementation.

1. Naval Air Warfare Center, Aircraft Division, Indianapolis

a. Status of Prior Innovations

Naval Air Warfare Center - Aircraft Division, Indianapolis (NAWC-AD-I) has been very successful in standing up self-managing work teams. As of 1991 two teams had been created to fill the position of a branch manager who was selected for another position. Both teams have approximately ten members working together to absorb the function of the previous branch manager. These teams have been so successful that NAWC-AD,I is preparing to stand up ten additional teams.

A problem noted since the initial implementation of self-managing work teams was the failure to properly identify boundaries for these teams up front. At the time the initial

teams were formed they were pilot programs treated as isolated entities. A top manager interviewed commented that the teams were given an ill-defined Charter (unwritten) without a set completion date. The organization did not look at the environment in which the team would be working. One interviewee explained that the self-managing teams' recommendations for improvement did not match the Executive Steering Committee's expectations. Since this early implementation, it has been recognized that successful self-managing teams need a definition of the relationship between the team and other organizational units, outside organizations, individuals, and supervisors. Questions need to be answered as to what administrative and technical responsibilities the teams will acquire and when they are going to acquire them. Also, it is important to identify those responsibilities the team will not acquire so that team expectations remain congruent with the organization's intent. There are also statutory requirements that self-managing teams cannot change, such as, pay increases, hiring and firing decisions, and promotions.

NAWC-AD-I's Management Healthcheck was a self-evaluation tool used to create an environment of continuous improvement. Upon a customer's or manager's request, a team from the Human Resources Office (HRO) or the Indiana Labor and Management Council conducted a review of that manager's unit within the organization. Data collected from employee

interviews, statistical data, and customer, supplier and employee questionnaires were provided to the manager for identifying personal development needs. (Applegate, 1991) The manager - initiated Healthcheck is no longer being used. The organization now takes a more proactive, corporate point of view and assessments are being done throughout the organization. When the organization was not taking such an active role, evaluations were only being done on a sporadic basis and only in areas where managers requested the assistance. Now, the organization views this quality improvement process as part of the overall "Concept of Operations". Thus, areas for improvement can be more readily identified and proactive remedial steps can be taken promptly rather than waiting for the inevitable problems or crises to occur.

The Blue Ribbon Contractor program has been very successful for NAWC-AD-I. This program was established in 1987 as a means to evaluate the vendors' on-time delivery of high-quality products in order to obtain the best value. It allowed awarding contracts based on past performance rather than to the lowest bidder. Results were seen early on as the late delivery rate for Blanket Purchase Agreements (BPA) decreased from over 40% to less than 10% in four years. (QIP, 1992) As reported by top management, in the last year, late deliveries have continued to decrease from 6% to 3%.

At NAWC-AD-I, a program was started to temporarily assign managers to Naval Air Systems Command (NAVAIR) in Washington D.C.. This type of experience has given managers insight into customer expectations. Due to the success of the program, the Center now provides this opportunity to any employee. Long-term assignments may be either at NAVAIR Headquarters or at the Headquarters of the Naval Air Warfare Center - Aircraft Division at the Naval Air Station (NAS) Patuxent River (PAX River), Maryland. NAWC-AD-I has been unsuccessful in getting NAVAIR or PAX River to work the program in reverse. This is mainly due to a decrease in manpower and limited funding at the other activities.

A variety of innovative recognition programs have been implemented at NAWC. Two of these programs, "Better Idea" and the "Order of the Skunk" have been very successful. The Better Idea program was designed to encourage employees to make job-related improvements which they could implement. Since the inception of the program in October of 1988, 397 ideas have been received and 286 have been implemented. (NAC, 1992)

The Order of the Skunk was a program designed to recognize individual or team ideas. Originally started in the research department, it has spread to other areas of NAWC-AD-I. Due to the administrative burden of running two programs, a team has been organized to consolidate these two recognition programs.

b. New Innovations

The Naval Supply Systems Command (NAVSUP) Red/Yellow/Green (R/Y/G) program began as a pilot program at NAWC-AD-I in August of 1989. This program was established to emphasize the contractor's quality history. This program provides additional quality data on contractors to the Blue Ribbon program data already available. In an effort to reduce the time it takes for a buyer to gather all available information on one screen, NAWC-AD-I is presently in the process of trying to get their Blue Ribbon Contractor program data rolled into NAVSUP's R/Y/G program. They anticipate this combination will provide faster service to customers by making buyers more productive and thus reducing turnaround time. It was estimated by one interviewee that approximately two million dollars has been saved due to the R/Y/G program. This program avoids going to those suppliers with a history of delivering a high number of rejects. Rejects adversely impact the schedule, maintenance and inspections, and waste time and effort. In the long run, poor quality products always cost more. An interviewee stated that, "If you go straight by cost, you have to go low bid. But the R/Y/G program will let you buy smart and take quality into account."

2. Aviation Supply Office

a. Status of Prior Innovations

The commitment to education and training by the work force is now more evident than ever at ASO's "Lunch and Learn" program. This completely voluntary program, which began in 1991, has been attended by more than 1,200 employees. (ASO, 1993) Employees view video presentations on TQL concepts and techniques while having lunch. The presentation is then concluded with one of the top managers leading a discussion on quality.

The various elements of the Recognition System at ASO have proven to be major successes. In 1990 a new recognition system was developed by a team of employees tasked with reviewing and improving the old system. This new system recognizes group/team effort and de-emphasizes individual performance. Also there is no longer a monetary award for individuals demonstrating high performance.

One type of non-monetary recognition is the "Unsung Hero Award" given to an employee or group for contributing to getting the job done. This award is given to those employees whose efforts ordinarily provide them only limited visibility. The award includes a plaque, certificate, and a photograph with the Commanding Officer.

Another type of non-monetary award is the "You Make a Difference Award." This award is given from one employee or

group to another. There is no supervisory approval required but concurrence by the specific individual group that is giving the award is required. The awardee receives a certificate, standing ovation, and a photograph with the Commanding Officer.

A third type of recognition which has been implemented is the Group Special Act Bonus. This is an annual cash bonus of \$200 which is shared equally by each ASO member who has helped to improve quality and productivity. This award has been given to 90% of the GS and FWS employees, grade 12 and below.

The final form of recognition is a semi-annual Recognition Day Celebration to which all ASO employees are invited. ASO recently held its sixth semi-annual Recognition Day Celebration in May 1993. Groups, teams, and individuals are recognized at this event. Many of the recognition and reward systems have become so institutionalized that the language has become part of the employees' daily lives.

ASO's Learning Center (LC) has started its tenth year of operations by moving into a modern center. In FY92, the Learning Center had over 1,000 course completions totaling 9,500 hours. (ASO, 1993) Over the last three years, the Learning Center has expanded to over 200 programs not counting videos. In addition to courses on TQL, additional courses now being taught by the Learning Center include English,

Writing, Grammar, Math, Statistics, Management and ADP for self-improvement of employees.

b. New Innovations

The Aviation Supply Office (ASO) recently stood up a prototype of a self-managing work team in January, 1993. The team has been tasked to support the airframe and avionics of the H-2 and H-60 helicopters. Diverse functional experts were brought together to work as a team in the business unit. A significant goal in this effort is to create a working environment free from the barriers inherent in traditional organizations with functional stovepipes. Many issues are still being worked out during the phase-in period such as the team's degree of financial autonomy, amount of resources allocated to the team, and responsibility for performance evaluations of team members.

Another new idea that is being implemented is the Common Work Plan which rates senior managers as a team instead of as individuals. The guiding assumption of this plan is that the senior managers rise or fall as a team and should therefore share equally in whatever bonus they might receive. Before the Common Work Plan was implemented, senior managers did not work well together and constantly competed with each other. They did not share information and often were looking out only for their individual interests. Changing the performance evaluation and reward system to a team rating

system has brought them together and has also broken down a lot of the resistance to teamwork and cooperation. Managers are now sharing information and working well together.

Supervisors are now being rated by their subordinates. In a new program, subordinates are given a questionnaire and asked to rate their supervisors. At first, there was fear from the workers that ratings would not be kept confidential and the supervisor would use the information against them. Also, supervisors were afraid that the employees would try to get even with them for bad performance ratings or other unpopular decisions. To counteract those fears, results of the survey are only given to the supervisors being rated. Supervisors are not required to pass their performance rating up the chain, but are required to share results with their subordinates. ASO is going through the second year of supervisor ratings. Both supervisors and subordinates are less intimidated with the process because they were able to observe confidentiality being maintained during the first cycle. After getting the results, a facilitator sits down with both supervisor and subordinates to discuss the manager's strengths and weaknesses and to develop a plan of action together. ASO has established a group to review this process after each cycle to evaluate its effectiveness and to make suggestions and/or improvements where needed.

The Aviation Supply Office is also looking at qualifying for a European/International Quality Standard known as ISO-9000. It is a management system that demands the commitment of the organization to provide goods or services that conform to the requirements of the customer. (Conover, 1993) It also requires the organization to maintain accurate and detailed records of its various operations. Materials used in the organization's products and services must conform to specific requirements and the company's processes must be defined, documented, and are subject to review and approval. The standard demands that a method be established to measure the organization's products so that they conform to all requirements all along the process, and that the equipment used to measure quality or requirements must be controlled, maintained, and subject to calibration. (Conover, 1993)

3. FISC, San Diego

a. Status of Prior Innovations

The "Masters of Excellence" program exposed managers to live presentations from America's top consultants in the quality area. This program was used in 1986 during the early implementation phase to educate managers in the field of Total Quality Management. Once all of the top managers were exposed to the TQM principles the program was brought in-house to train new managers.

The training program which began in 1986 for newly reporting officers proceeds as follows: The officer is given a list of books to read and tapes to view regarding TQL. The officer is also given six weeks to study and learn every aspect of the command, first hand, from the lowest levels to the top. The officer reports every two weeks to the Executive Officer to review what he has learned.

b. New Innovations

Following the major reorganization of approximately a year ago and the present reorganization in progress, the FISC, San Diego is attempting to develop the capacity to continually reorganize themselves. The FISC, San Diego is striving to be flexible to the customers' needs and provide them the support they require. This will enable FISC, San Diego to better support their customers in these changing times.

Another aspect is that, as FISC, San Diego's role changes, they are retraining displaced workers by cross training those who wish to move into other functional areas. FISC, San Diego is also paying for books and tuition for college level courses for those employees who wish to improve themselves in order to become more marketable for future employment. They have also established a Mentor Program teaming up supervisors and nonsupervisors. The supervisor

works directly with the employee, advising and helping the employee grow professionally.

Training is taking on a new focus. A major directional change for the organization is to bring in new business. To be able to do this, FISC personnel are developing marketing and negotiating skills. Training courses are being developed around these concepts, and individuals who have primary contact with customers will receive training to polish their communications and team building skills. Training is also being provided for specific groups like QMBs and PATs that require additional training in group dynamics, brainstorming, as well as other topics.

FISC San Diego is participating in joint PATs with some of its customers. This joint teaming arrangement is optimistic that the changes they make will improve the Navy as a whole. Also, there were many common problems that could be more easily resolved by combining their efforts.

C. SURVEY

To provide a broader range of perspectives on the implementation of TQL at the three Naval activities, a survey was distributed to personnel from various levels. The survey had a total of seventy-four questions (not including demographic questions) which were grouped into eight critical factors. (Table II.) A complete copy of the survey as it was

Table II EIGHT CRITICAL FACTORS (SARAPH et. all, 1989)

**Mean Rating of
Eight Critical Factors
of Quality Management***

<u>FACTOR</u>	<u>MEAN</u>
Factor 1: Role of top management and quality policy	3.39 (1.24)
Factor 2: Role of the quality department	3.96 (1.06)
Factor 3: Training	3.53 (1.10)
Factor 4: Product/service design	3.21 (0.98)
Factor 5: Supplier quality management (supplier of goods and/or services)	2.98 (1.14)
Factor 6: Process management/operating procedures	3.05 (1.03)
Factor 7: Quality data and reporting	2.78 (1.07)
Factor 8: Employee relations	3.34 (1.00)

* Saraph, Benson and Schroeder, 1989

Note: All means were found to be statistically different ($p < .05$) from each other if the difference were greater than .2. Standard Deviation given in parenthesis

distributed to respondents is found in Appendix A. Appendix C shows the survey items organized by each of the eight critical factors mentioned previously. Participants were asked to express their feelings about the extent or degree of current TQL practices at their commands. The questions were configured to allow the participant to indicate their rating using a Likert-type scale of one to five where one equals strongly disagree and five equals strongly agree. The ratings on all questions relevant to each of the eight factors were averaged to give a composite score for that factor.

1. Demographics

Demographic information was obtained from each respondent who completed the demographic section. The respondents' name and position were optional. Out of the sixty surveys mailed to the three activities, a total of thirty-three were completed and returned.

Approximately 33.3% of the surveys returned were from personnel with some degree of contracting experience. There was an average of 10.6 years of contracting experience, 18.3 years of Government service and 63.6% of the respondents with contracting experience were in supervisory positions. Approximately 81.8% have been in their present position for less than two years while 1% have held their position for greater than five years.

Among the surveys, 66.7% were returned from personnel with no contracting experience. The average number of years of Government service for the non-contracting participants was 19.4 years and approximately 47.8% of the non-contracting respondents were supervisors. Further, approximately 81.8% have been in their present position for less than two years while 1% have held their position for greater than five years.

2. Overall Results

Table II represents the mean rating of the eight critical factors used by Saraph, Benson, and Schroeder. (1989) A paired t-test comparison of all means found that means were statistically different ($p < .05$) if the ratings differed by more than .2. For example, Factor 4 (3.21), Factor 8 (3.34), and Factor 1 (3.39) must be viewed as having equivalent rating. The role of the quality department ranked the highest, while "Supplier quality management" and "Quality data and reporting" scored the lowest. It is notable that the highest rating is for the "Role of the Quality Department" when this concept, as a distinct feature in the organization, is challenged by many TQL authors. The second highest rating is for training, followed by an equivalent cluster that includes the "Role of top management", "Employee relations", and "Product/service design".

These scores cannot be directly compared with Carolyn Applegate's results because her sample consisted of only the

executive steering committee and the data here represent responses from multiple levels within each organization. However, the relative order has changed. The "Role of top management" is not as critical as it was, "Training" has moved to the second highest rated Factor. The biggest change has been the shift of "Quality data and reporting" from the sixth ranked spot to the eighth.

The following sections present each of the eight critical factors and the rating percentage in each response category for the composite of questions that made up each factor. The frequencies and mean for each factor is computed from the combined ratings of the component questions. For each of the eight critical factors specific questions will be discussed which reflect the strongest and weakest aspect of that factor. Appendix C presents the mean ratings of all survey items organized by the eight critical factors.

3. Factor 1: Role of Top Management and Quality Control

This factor addresses such areas as top executives assuming responsibility for quality performance and specificity of quality goals within the organization. Other questions address the degree to which top management considers quality management as a way to increase productivity and reduce cost. The frequency of the participants' responses were as follows:

		<u>Respondents</u>	
<u>Response</u>		<u>Percentage</u>	
1	Very Low	6.3	
2	Low	17.7	
3	Medium	28.9	
4	High	29.6	
5	Very High	<u>17.5</u>	
Total		100.0	

Factor 1 had a mean of 3.39 with a standard deviation of 1.24. Of the participants 47.1% were above the midpoint while 24% were below the midpoint.

Within this factor, the item with the highest mean rating was "The degree to which top management considers quality improvement as a way to increase productivity and reduce costs" (mean = 3.7). "Acceptance of responsibility for quality by major branch/department heads within the organization" and "Extent to which top management has objectives for quality performance" were also rated high. (mean = 3.6) The lowest rated item was "The degree to which

top management (Commanding/Executive officer and major department heads) is evaluated for quality performance" (mean = 2.9).

4. Factor 2: Role of Quality Department

This factor addresses such issues as the visibility of and access to top management and amount of coordination between other departments and the quality department. The frequency of the participants' responses were as follows:

<u>Response</u>		<u>Respondents</u>
		<u>Percentage</u>
1	Very Low	3.6
2	Low	6.1
3	Medium	18.2
4	High	35.2
5	Very High	<u>36.9</u>
Total		100.0

Factor 2 had a mean of 3.96 with a standard deviation of 1.06. Of the participants 72.1% were located above the midpoint, while 9.7% were located below the midpoint.

The question evaluating "The Quality department's access to organizational top management" had the highest mean (4.6) among the five component items. In contrast, the "effectiveness of the quality department in improving quality" was rated as only moderate with a (mean = 3.2).

5. Factor 3: Education and Training

This factor addresses such areas as quality-related training given to non-supervisors, supervisors and top management throughout the organization and the commitment of top management to employee training. The frequency of the participants' responses were as follows:

		<u>Respondents</u>
	<u>Response</u>	<u>Percentage</u>
1	Very Low	6.4
2	Low	10.6
3	Medium	22.8
4	High	41.3
5	Very High	<u>18.9</u>
	Total	100.0

Factor 3 had a mean of 3.53 with a standard deviation of 1.10. Of the participants 60.2% were above the midpoint while 17.0% were below the midpoint.

Two items in this factor received mean ratings of 4.0: "Quality-related training given to managers throughout the organization" and "Training in the total quality concept (i.e., philosophy of organizational-wide responsibility for quality) throughout the organization." The lowest rating was for the question concerning "Training in advanced statistical techniques (such as design of experiments and regression analysis) in the organization as a whole" (mean = 2.4).

6. Factor 4: Product/Service Design

This factor addresses such areas as thoroughness in design reviews before a new process/service is implemented and the extent of analysis of customer requirements in the design process. The frequency of the participants' responses were as follows:

		<u>Respondents</u>	
	<u>Response</u>		<u>Percentage</u>
1	Very Low		3.1
2	Low		18.7
3	Medium		43.9
4	High		22.7
5	Very High		<u>11.6</u>
	Total		100.0

Factor 4 had a mean of 3.21, with a standard deviation of 0.98. Of the participants 34.3% were above the midpoint while 21.8% were below the midpoint.

The question with the highest rating in this factor was "The extent of analysis of customer requirements in the process/service development process" (mean = 3.5). The lowest rating was for "Thoroughness of new process/service design reviews before the process/service is implemented and produced" (mean = 2.9).

7. Factor 5: Supplier Quality Management

This factor addresses such areas as selection of suppliers based on quality rather than price. It also addresses technical assistance provided to suppliers and the responsibility assumed by the purchasing department for the quality of incoming products/services. The frequency of the participants' responses were as follows:

<u>Respondents</u>		
<u>Response</u>	<u>Percentage</u>	
1 Very Low	10.7	
2 Low	22.3	
3 Medium	36.9	
4 High	18.5	
5 Very High	<u>11.6</u>	
Total	100.0	

Factor 5 had a mean of 2.98 with a standard deviation of 1.14. Of the participants 30.1% were above the midpoint while 33.0% were below the midpoint.

The two questions with the highest ratings (means = 3.3) addressed "The extent to which longer term relationships are offered to suppliers" and "The extent to which technical assistance is provided to suppliers". Six of the ten questions for this factor received ratings at or below the midpoint. The lowest rating came from the question that dealt with the "extent to which suppliers are selected based on quality rather than price or schedule" (mean = 2.3).

8. Factor 6: Process Management/Operating Procedures

This factor addresses such areas as the use of statistical process control charts to control processes, self-inspection of work by workers, and amount of incoming, in-process and final inspections, and review or checking of work. The frequency of the participants' responses were as follows:

<u>Respondents</u>		
<u>Response</u>	<u>Percentage</u>	
1 Very Low	6.5	
2 Low	15.9	
3 Medium	29.8	
4 High	30.3	
5 Very High	<u>17.5</u>	
Total	100.0	

Factor 6 had a mean of 3.01 with a standard deviation of 1.03. Of the participants 47.8% were above the midpoint while 22.4% were below the midpoint.

The question in this factor with the highest rating was "The amount of final inspection, review, or checking with regard to process management/operating procedures" (mean = 3.6). It is noteworthy that this item reflects a practice not espoused by TQL experts and yet the practice of final inspections continues to be more common than incoming (mean = 3.0), in-process inspections (mean = 3.3) or self-inspections by workers (mean = 3.4). Six of the 12 items for this factor had ratings below the midpoint. The lowest rating was "The extent to which inspections, review, or checking of work is automated" (mean = 2.5).

9. Factor 7: Quality Data and Reporting

This factor addresses such areas as the availability of quality data, the extent to which quality data is used as a tool to manage quality, and the extent to which quality data is used to evaluate supervisor and managerial performance. The frequency of the participants' responses were as follows:

<u>Respondents</u>		
	<u>Response</u>	<u>Percentage</u>
1	Very Low	11.1
2	Low	30.7
3	Medium	33.0
4	High	17.5
5	Very High	<u>7.7</u>
	Total	100.0

Factor 7 had a mean of 2.8 with a standard deviation of 1.01. Of the participants 25.2% were above the midpoint while 41.8% were below the midpoint.

The highest rated question was the "Use of quality data as a tool" received only a moderate rating (mean = 3.0). Every other question on this factor falls at or below the midpoint rating of three. The lowest rated question was the "availability of cost of quality data" (mean = 2.1).

10. Factor 8: Employee Relations

This factor addresses such areas as the extent to which employees are held responsible for error-free output, the amount of feedback provided to employees on their quality performance and the extent to which employees are recognized for superior quality performance. The frequency of the participants' responses were as follows:

<u>Respondents</u>	
<u>Response</u>	<u>Percentage</u>
1 Very Low	2.7
2 Low	17.0
3 Medium	39.0
4 High	28.8
5 Very High	<u>12.5</u>
Total	100.0

Factor 8 had a mean of 3.3 with a standard deviation of 1.04. Of the participants 41.3% were above the midpoint, while 19.7% were below the midpoint.

The question with the highest rating dealt with "Employee involvement type programs" (mean = 3.5). The lowest rated questions were "The extent to which employees are held responsible for error-free output" (mean = 2.8) and "The amount of feedback provided to employees on their quality performance (mean = 3.0).

V. ANALYSIS

A. INTRODUCTION

This analysis uses the philosophy, concepts, principles and theories expressed in the Literature Review Chapter to explain and evaluate the findings resulting from personal interviews and survey questionnaires. The analysis follows the previous format for discussing the eight Critical Factors in implementing and sustaining a total quality program.

B. THE ROLE OF MANAGEMENT LEADERSHIP AND QUALITY POLICY

1. Literature Review

- a) Requires a strong, visible commitment to quality.
- b) DoN favored Dr. Deming because of his emphasis on Leadership.
- c) Quality philosophy requires a transformation from autocratic/dictatorial management styles.
- d) Leaders must present a clear vision for the future and set specific, measurable goals.
- e) Quality must be monitored, measured.

2. Interviews/Survey Responses

- a) Top management is strongly committed, high profile, personally involved throughout life of quality program.
- b) Top management continues to provide guidance, vision, direction, encouragement and participation.

c) Top managers are trained to sustain the total quality effort, especially to compensate for military tours/turnovers.

d) Top managers sincerely believe that quality will increase productivity/profitability and reduce costs.

e) Top managers have accepted responsibility for total quality and for evaluations based on quality performance.

f) Some skepticism about leadership commitment still exists within organizations as reflected by interviews. This could be related to one of the lowest rated items on this component of the survey. "Extent to which quality goals and policies are understood within the organization." (mean = 3.0)

C. THE ROLE OF THE QUALITY DEPARTMENT

1. Literature Review

a) Role of the Quality Department is changing.

b) TQM/TQL advocates stress inspections for quality throughout the process rather than only at the end of the process. This prevents problems rather than merely correcting problems.

c) Need to teach those responsible for a process how to determine if it is stable. A process cannot be measured or improved unless it is stable.

d) Quality is inherent in everyone's job.

2. Interviews/Survey Responses

a) Quality Departments dissolved and individuals became members of cross functional teams.

b) Quality Departments took their expertise into the work centers.

c) Quality Departments are being used for specific training of groups in quality related items such as, flow charts and process mapping.

d) Quality Department access/visibility to top management is very high per survey.

e) Effectiveness of the Quality Department in improving quality received the lowest rating in this category on the survey, but this may be recognition that Quality Department cannot improve quality alone. Improvements must come from the team.

D. EDUCATION AND TRAINING

1. Literature Review

a) Education and training are essential to implementation of TQL.

b) Dr. Deming called for total reconstruction of training.... Training is continuous and never ending.

c) Training is required for everyone in the organization.... TQL is for top management down to the junior employee.

d) Top managers must set the example and participate fully and actively in TQL training.

e) Dr. Deming said that if process had not reached statistical control (stable state), training would help.

f) Management needs training to better understand the internal processes of the organization.

g) TQL training is required to properly use the tools and techniques of TQL and process control.

2. Interviews and Survey Response

a) Major emphasis continues to be placed on training.

b) Senior level and lower level personnel were trained first. Where middle level managers were omitted from training until very late it has been acknowledged as a grave mistake.

c) Training was initially accomplished by consultants, then brought "in-house" after trainers were trained.

d) Training shifted from general orientation to more specialized courses.

e) A by-product of total quality improvement efforts was the offering of many basic skills classes in Math, English, Writing and Grammar that were seen as important to continually improving process.

f) Senior and mid-level managers should receive TQL training prior to assuming new responsibilities.

g) Provision of quality training rated high in survey. Training in advanced statistical techniques scored low in

survey. This illustrates a lag between the training focused on the philosophy and values of TQL and the measurement tools needed to identify and evaluate areas for process improvement.

E. PRODUCT/SERVICE DESIGN

1. Literature Review

a) Product/Service Design and development must meet the customer's needs and requirements.

b) Communication is required between customer and supplier so that everyone understands what is required.

c) New product design requires communications between departments. Without coordination, quality is suspect.

d) Quality improvement envelops the entire production/service line from incoming raw material to the final product/service delivered to the customer.

e) Quality Function Deployment (QFD) provides for earlier development by defining the product better and thoroughly documenting the design process.

2. Interviews/Survey Responses

a) Establishment of customer-focused self-managing teams and business units comprised of people with diverse functional skills.

b) Important that customers "buy in" up front, and be fully involved in early planning.

c) Participation in joint PATs and QMBs with customers and suppliers.

d) Elimination of chimneys to foster teamwork and increase communications among departments.

e) Survey indicates a moderately high degree of analysis of customer requirements.

f) Survey reports a lower degree of thoroughness of new process/service design review before implementation, the extent of coordination among departments in the development process and the extent to which implementation/produceability is considered in the design process. This suggest that while greater horizontal coordination has begun, it is an area that can continue to improve.

F. SUPPLIER QUALITY MANAGEMENT

1. Literature Review

a) Long term relationships with suppliers recommended.

b) Need to educate suppliers with regards to the organization's specific requirements.

c) Purchases should be limited to those suppliers who have quality programs in place.

d) Purchase criteria should shift from lowest bid to lowest overall life cycle cost.

2. Interviews/Survey Responses

a) Suppliers are selected based on performance and quality, not just lowest price.

b) The Blue Ribbon Contractor Program evaluates vendor's on time delivery performance.

c) The Red/Yellow/Green Program emphasizes contractor's overall quality history.

d) Overall assessment of this Factor in the survey was moderate to low. This rating could be attributed to legislative contracting restrictions.

e) Survey rated very low the extent that suppliers are selected based on quality performance and quality products. Again, this is likely due to legislative restrictions.

G. PROCESS MANAGEMENT/OPERATING PROCEDURES

1. Literature Review

a) Process management ensures that the right tasks are identified and monitored for improvement.

b) By mapping out the process, managers will begin to see the organization's operation as a whole.

c) Saraph et al., study does not properly identify the process management factor in that it fails to recognize the disconnect between functional interfaces.

d) Departments tend to view each other as a threat, and therefore withhold information. This can be detrimental to the quality process.

e) Plan, Do, Check, Act Cycle provides a structured disciplined approach to monitor processes on a routine basis.

f) TQM/TQL advocates stress inspections for quality throughout the process rather than only at the end of the

process. This prevents problems rather than merely correcting problems.

2. Interviews/Survey Responses

a) Eliminated the chimneys, and reorganized horizontally to improve communication and coordination.

b) Middle managers were removed from their traditional roles and converted to associates. Associates became personally responsible and accountable for process improvement.

c) Empowered employees to take responsibility for the process and improving it.

d) Must map out the process to maintain process control, so everyone performs a task the same way.

e) Activities did not find it difficult to map out the processes, but it was hard to determine the proper measurements to take.

f) The extent to which inspections, review, or checking of work is automated was ranked low in the survey.

g) Use of acceptance sampling to accept/reject lots or batches of work was low in the survey.

f) Extent to which process design is "fool-proof" was ranked low in the survey.

g) Amount of final inspections, review, or checking was high. Although we talk TQL, there is a continuing

reliance on final QA inspections or supervisor's check before a product goes out the door.

f) It is of interest to note that the high rating for inspections reflects a practice not espoused by TQL experts.

H. QUALITY DATA AND REPORTING

1. Literature Review

a) Measurement of processes is critical to successful quality management.

b) In order to make informed decisions, managers need timely and accurate data.

c) Proper measurements can be used to correct problems before they occur.

d) Measurements should be displayed for all to see, since they provide visible proof of process improvement and employee recognition.

e) The gathering of data and their subsequent analysis and evaluation is the foundation of continuous process improvement.

2. Interviews/Survey Responses

a) Activities are keeping track of the quality history performance of suppliers.

b) One activity is keeping track of on-time deliveries. Those suppliers with a bad record of performance are dropped, and the activity goes to other suppliers even if more expensive.

c) Only review those measurements that will permit a change to the product or process. All other measurements are a waste of time.

d) Overall rating of the management of quality data from the survey was lowest of the eight factors.

e) The availability of "Cost of quality data" and the extent to which quality data are displayed for employees were given low ratings on the survey.

I. EMPLOYEE RELATIONS

1. Literature Review

a) Employees are a vital and valuable resource.

b) Employees should be encouraged to make suggestions. Management must take action and be responsive to employees' needs and perceptions.

c) Employees must be recognized and thanked for their willingness to accept personal accountability for process improvement.

d) Employee personal satisfaction and enhanced self-esteem is important for morale and high productivity.

2. Interviews/Survey Responses

a) Management recognizes the importance of two-way communications.

b) Recognition and awards are shifting from monetary to non-monetary, such as plaques, certificates, and photos taken with the Commanding Officer.

c) Emphasis is also shifting from individual awards to group and team recognition.

d) Organizations are enhancing employee self-esteem and job satisfaction by empowerment, expanding employees' decision-making roles and functions at the lowest level possible, and listening to employees.

e) Self-managing teams allow employees to assume the role of mid-management on a temporary or project basis.

f) Survey findings reveal the extent that employees feel that they are being recognized for their superior quality performance is only average.

g) Survey respondents gave slightly above average marks to the extent to which TQM/TQL has been implemented.

h) Lowest marks were given to the extent to which employees are held responsible for error-free output.

i) Organizations implementing self-managing teams are continuing to define what should be the boundaries of responsibility.

J. CUSTOMER SATISFACTION

1. Literature Review

a) Customer must be the primary focus of everything that we do. Organizations must be customer-driven.

b) Both external and internal customers must be considered and served well.

c) Improvements in quality must be aimed at the customer, both present and future.

d) Organizations must know and understand the customers' requirements. This requires extensive communications and careful listening.

e) Early and extensive involvement in the process by the customer permits the organization to better define the customers' requirements and the customer can begin to appreciate the capabilities and limitations of the supplier.

2. Interviews/Survey Responses

a) Activities are reorganizing to provide better service to their customers by presenting one point of contact.

b) Customers are being brought into the organization to more fully integrate them into the activity's goals and analyses of processes.

c) Customers are actively participating in joint PATs in order to solve common problems and seek cost-effective solutions.

d) Activities are visiting and sending work-teams to their external customers' locations in order to better understand their requirements.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

For consistency in presentation, conclusions are presented in the same order and format as the Saraph et al., Eight Critical Factors, plus the added ninth Factor which addresses Customer Service.

B. THE ROLE OF MANAGEMENT LEADERSHIP AND QUALITY POLICY

It is evident from the research findings and analysis that, in all three activities studied, top management recognizes the importance of its unique role in implementing TQL. Top management considers improvement in quality as a means to increase productivity and reduce costs. In addition, top management continues to be personally involved with the implementation of TQL by establishing goals and directives through the use of strategic planning and by personal commitment. All three activities studied have issued strategic plans with quality as a primary issue and have circulated these plans to their employees to specify the quality goals within the organization.

Personal commitment is also evident by the one-on-one, face-to-face communications between top management and employees. One example was the Commanding Officer at one organization who personally participated by manning a booth

during "Quality Month" to address employees' questions and concerns regarding Total Quality Implementation at the command. Another example is the regular "all-hands" meetings where the Commanding Officer and other members of top management meet with employees to discuss their concerns.

It is imperative that top management personally supports and leads the implementation of Total Quality Leadership by participating in Executive Steering Committees and Quality Management Boards and continues to maintain high profile involvement throughout the life of the program. The need for this continuing involvement is evidence by the lingering skepticism that exists among some organizational members and the need for greater awareness of the organization's quality goals and processes.

C. ROLE OF THE QUALITY DEPARTMENT

The role of the Quality Department performing quality inspections only at the end of the process is outdated. The Quality Department must be involved throughout the entire process, as well as an integral part of the work centers, in order to help monitor and make recommended changes in a timely manner. The goal is to prevent rejects and to produce a quality product every time.

The Quality Department must have access and visibility to top management and be able to make recommendations toward system improvement. The notion that quality is everyone's

responsibility must be emphasized. As Dr. Deming stressed, the responsibility for quality must be placed in the hands of the process owners. Progress towards this is demonstrated by the integration of quality department members into cross-functional teams. However, the reliance on final inspection procedures continue to dominate over alternatives such as self-inspections and addressing quality issues in the design phase.

D. EDUCATION AND TRAINING

Exhaustive, detailed, "top to bottom" training is the major key to the successful implementation of Total Quality Leadership. This will require a significant allocation of resources (people, time and money) to support TQL within the organizations. However, improvement in quality is worth the cost. It is a matter of organizational survival.

TQL philosophy, theories, and tools must be taught to "all hands", not just senior management. By teaching the basic philosophy of TQL, the fears and many of the barriers to the successful implementation of TQL may be eliminated or at least reduced. Training, although important, will not provide overnight results. Some commands have instituted additional training in areas of English, Grammar, Writing, and Management to give the people the skills necessary for continuous process improvement. This is in addition to the training in Total Quality Leadership applications already provided in

Statistical Process Control, ADP, and Flow Charting. These programs should be continued and expanded to other appropriate activities.

E. PRODUCT/SERVICE DESIGN

Full implementation of Total Quality Leadership will be limited if activities only make internal changes. External customers must be involved also. Customers and suppliers must be included in Quality Management Boards and Process Action Teams in order to solicit their support, their requirements and their advice.

Organizational structures must be evaluated to ensure that lines of communication are open and that information flows freely to all who need to know. Organizations are changing to "flatter" or more horizontal forms with fewer layers of management. A positive result of reorganization was the Single Point of Contact or One Stop Shopping to improve service to customers and provide for quality feedback.

F. SUPPLIER QUALITY MANAGEMENT

Present DoD procurement regulations limit long-term relationships with a single supplier as Deming has suggested. To be able to fully implement the concepts of Total Quality Leadership, changes will have to be made to current laws, rules and regulations. This should be made a matter of priority and directed from a high level in DoD.

Innovative, progressive programs such as the Naval Air Warfare Center's Blue Ribbon Contractor Program and NAVSUP's Red/Yellow/Green Program should be expanded to other organizations. Quality improvement efforts must involve the suppliers at an early stage and continue throughout the process to ensure customer satisfaction.

G. PROCESS MANAGEMENT

Process management and the ability to change in order to meet internal and external customers needs may be limited by physical, geographical and/or organizational forces which are beyond the control of process managers. This is illustrated by FISC, San Diego's moving its supply support personnel to the center of force concentrations. If either internal or external customer feedback indicates a quality problem, and flow charts/mapping techniques confirm that a solution beyond the scope of the present organizational structure is required, then reorganization and/or relocation of the process becomes mandatory. It may be that some of our current organizations and/or facilities cannot achieve an acceptable level of quality given their current constraints. Process management documentation and techniques will help to confirm this situation and also point the way to potential solutions.

Although Total Quality Leadership and the Deming philosophy advocate eliminating final checks, there is still an emphasis on final inspection, review and checking. Even

with all the TQL training with regard to statistical control charts to control processes, there is little evidence of real use. Flow charts, mapping and measurement must be re-emphasized so that management and employees can see the "big picture". Also, again, communications must flow freely both horizontally and vertically. The process will never really be improved without accurately measuring variations.

H. QUALITY DATA AND REPORTING

Accurate measurement of the process is key to Quality Management. It is important that the worker be empowered to make decisions relative to the processes under his control. However, those decisions must be made with accurate data.

Top management must re-emphasize the importance of measurement and provide sufficient training until the quantitative processes are well understood. Measurements must not be excessive or wasteful. Only measure those elements of the process which can be changed.

In order to improve reliability and credibility, the quality of TQL data must be upgraded. All data should be readily available for review by all interested/involved parties.

I. EMPLOYEE RELATIONS

Employees are a vital, key resource. This is evident by the amount of time and money being spent on training.

Empowerment of employees, after training, is essential to quality processes.

A variety of methods have been used successfully to involve employees in quality efforts. These methods include a significant involvement in Process Action Teams, self-managing teams, temporary assignment to other locations, and actively participating in recognition programs. These are excellent, and should be continued and expanded.

Recognition and rewards, both monetary and non-monetary, are essential to motivate and encourage performance. Recognition is an important factor in total quality also. While the emphasis on rewards is shifting to teams and groups, there is still a need to recognize individual performance as well. Managers need to remember that "People make it happen!"

J. CUSTOMER RELATIONS

Numerous programs have been established in order to obtain customer feedback. Initially, only internal customers were solicited for evaluations. Currently, the emphasis has shifted to external customers as well. Management must recognize that no element of the process can be omitted if we are to achieve true quality performance. By involving the customer early in the process, communications are improved.

We need to continually focus our attentions on the customer and his needs. A completely satisfied customer is the goal.

Top management should meet with customers both in-house and at the customer's facility in order to discuss project requirements for a better understanding of customers' needs. The idea of exchanging staff members and employees between suppliers and customer is excellent and should be continued and expanded. Everyone benefits from this type of exchange program.

K. ANSWERS TO RESEARCH QUESTIONS

1. Primary Research Questions

What is the current status of implementation of TQL at three Navy activities identified in Carolyn Applegate's thesis?

Telephone interviews and surveys results indicate that the Naval Air Warfare Center, Aircraft Division, Indianapolis; Aviation Supply Office; and the Fleet and Industrial Supply Center, San Diego are continuing to successfully implement TQL.

2. Subsidiary Research Questions

a. To what extent have the benefits of TQM/TQL been realized and what factors have been critical to its success or failure?

In all three organizations TQL is fully supported by top management. All three activities have reduced costs and have been able to increase employee satisfaction and improve working relations with suppliers/customers. ASO has

decreased backorders 18% from an average of 259 days to 213 days. Cost savings come from a reduction in waste and defective parts. Feedback from suppliers and customers have indicated an improvement in turnaround time for requisitions, handling routine items in a minimal amount of time. This is evident by ASO's decrease in Quality Deficiency Reports (QDRs) by over 70%.

Critical factors to the success of TQL have been top management's involvement and support. Throughout the implementation of TQL, "top/down" training is crucial. Training enhances the knowledge and ability of the process managers to produce a quality product.

b. What is the status of particular innovations that were outcomes of early TQL implementation as identified by Carolyn Applegate?

Most of the innovations that were identified by Carolyn Applegate such as self-managing teams, educational and training programs, recognition and reward systems and performance appraisal systems are being successfully implemented at all three organizations with few exceptions. The Naval Air Warfare Center, Aircraft Division, Indianapolis Blue Ribbon Contractor Program has decreased late deliveries from over 40% to less than 3% since it was started in 1987. For a detailed review, see Chapter IV, Section B.

c. Based on the results of prior research, what are the key issues that must be addressed or resolved in achieving quality leadership?

TQL is not really a radical change in the way effective leaders get tasks performed. Leaders inspire, delegate and motivate their people. Dr. Deming's philosophy is consistent with the "ages old" rule of leadership. A happy, content work force is best qualified to control their own processes. The leader ensures that the workers have the proper resources, tools and environment in which they can effectively perform their functions. An effective leader will create a sense of ownership in the hearts and minds of the employees. This sense of ownership will produce quality products and services.

As activities continue to implement TQL there is shift in organization structure from a vertical structure to a more horizontal one. This is a natural progression as the organization becomes more fluent in TQL principles and begins to understand how the work is done.

L. RECOMMENDATIONS

These recommendations are based on the findings from the interviews, surveys, and analysis of the status of implementing TQL at selected activities.

1. Top management in all organizations within the Department of the Navy should embrace Total Quality Leadership.

Without the active leadership and personal involvement of top management, Total Quality Leadership will not be fully implemented. Employees are more willing to participate if top management is also involved. Implementation of Total Quality Leadership is a long term process and will require a cultural change in the organization.

2. A major commitment must be made to training if successful implementation of TQL is to occur.

Provide adequate time and resources for extensive TQL training of all employees from "top/down". Education and training will help accelerate the TQM movement by bringing everyone to a basic level of knowledge and then building specific skill areas to enhance process improvement capabilities.

3. Establish control measures.

Control measures are essential for quality improvement. Calculation and availability of control data must be improved so that it becomes more practical for the work force to use. There many things that make measurements necessary when trying to control a process. As Deming says, "you can't control what you don't measure."

M. FUTURE AREAS OF RESEARCH

This paper discussed three DoN activities and the current status, as well as innovative techniques, of implementing TQL at each activity. This study did not include the Executive Steering Committee response to implementing TQL, nor any changes thereto. A future study might be to survey the same ten activities as Carolyn Applegate and compare findings.

Another area to consider is the new ISO 9000 International Quality Program, and how it might affect Government procurement/contracting activities.

A third area of research would be to identify those statutes, regulations, and/or policies that act as potential barriers to TQL implementation. This was determined to be a barrier to fully implementing self-managing teams and long term relationships with suppliers.

A last area for future research might examine whether restructuring to a team-based or matrix format is a natural evolution in the continued implementation of TQL.

APPENDIX A (Survey)

	<u>Extent or Degree of Current Practice Is</u>				
	Very Low	Low	Medium	High	Very High
Extent to which the top executive assumes responsibility for quality performance.	1	2	3	4	5
Visibility of the quality department.	1	2	3	4	5
Specific work-skills training (technical and vocational) given to non-supervisory employees throughout the division.	1	2	3	4	5
Thoroughness of new process/service design reviews before the process/service is implemented/produced	1	2	3	4	5
Extent to which suppliers are selected based on quality rather than price or schedule.	1	2	3	4	5
Use of acceptance sampling to accept/reject lots or batches of work.	1	2	3	4	5
Availability of cost of quality data in the organization.	1	2	3	4	5
Extent to which TQL/TQM is implemented in the organization.	1	2	3	4	5
Acceptance of responsibility for quality by major branch/department heads within the division.	1	2	3	4	5
Quality department's access to top management.	1	2	3	4	5

Extent or Degree of Current Practice Is
Very Low Low Medium High Very High

Quality-related training given to non-supervisory employees throughout the organization.	1	2	3	4	5
Coordination among affected departments in the process/service development process.	1	2	3	4	5
Thoroughness of the supplier rating system.	1	2	3	4	5
Availability of quality data (error rates, defect rates, scrap, defects)	1	2	3	4	5
Effectiveness of TQL/TQM in the organization.	1	2	3	4	5
Degree to which top management (commanding officer/executive director/major department heads) is evaluated for quality performance.	1	2	3	4	5
Autonomy of the quality department.	1	2	3	4	5
Quality-related training given to managers and supervisors throughout the organization.	1	2	3	4	5
Extent to which new process/service emphasized in relation to cost or schedule objectives.	1	2	3	4	5
Reliance on reasonably few quality suppliers.	1	2	3	4	5

Extent or Degree of Current Practice Is
Very Low Low Medium High Very High

Extent to which inspection, review, or checking of work is automated.

1 2 3 4 5

Timeliness of the quality data.

1 2 3 4 5

Extent to which employees are held responsible for error-free output.

1 2 3 4 5

Extent to which top management supports long-term quality improvement process.

1 2 3 4 5

Amount of coordination between the quality department and other departments.

1 2 3 4 5

Training in the "total quality concept" (i.e. philosophy of organization-wide responsibility for quality) throughout the organization.

1 2 3 4 5

Clarity of process/service specifications and procedures

1 2 3 4 5

Extent to which organization educates suppliers as to its quality requirements.

1 2 3 4 5

Amount of incoming inspection, review, or checking.

1 2 3 4 5

Extent or Degree of Current Practice Is
Very Low Low Medium High Very High

Extent to which quality data (cost of quality, defects, errors, scrap, etc.) are used as tools to manage quality.	1	2	3	4	5
Amount of feedback provided to employees on their quality performance.	1	2	3	4	5
Degree of participation by major branch/department heads in the quality improvement process.	1	2	3	4	5
Effectiveness of the quality department in improving quality.	1	2	3	4	5
Training in the basic statistical techniques (such as histograms and control charts) in the organization as a whole.	1	2	3	4	5
Extent to which implementation/producibility is considered in the process/service design process.	1	2	3	4	5
Technical assistance provided to the supplier.	1	2	3	4	5
Amount of in-process inspection, review, or checking.	1	2	3	4	5
Extent to which quality data are available to non-supervisory employees.	1	2	3	4	5
Degree of participation in quality decisions by non-supervisory employees.	1	2	3	4	5

	<u>Extent or Degree of Current Practice Is</u>				
	Very Low	Low	Medium	High	Very High
Extent to which top management has objectives for quality performance.	1	2	3	4	5
Training in advanced statistical techniques (such as design of experiments and regression analysis) in the division as a whole.	1	2	3	4	5
Quality emphasis by customer service employees.	1	2	3	4	5
Involvement of the supplier in the product development process.	1	2	3	4	5
Amount of final inspection, review, or checking.	1	2	3	4	5
Extent to which quality data are available to managers and supervisors.	1	2	3	4	5
Extent to which quality improvements are viewed as ongoing responsibility of all employees.	1	2	3	4	5
Specificity of quality goals within the organization.	1	2	3	4	5
Commitment of the top management to employee training.	1	2	3	4	5
Extent to which longer term relationships are offered to suppliers.	1	2	3	4	5

Extent or Degree of Current Practice Is
 Very Low Low Medium High Very High

Stability of production schedule/work distribution.	1	2	3	4	5
Extent to which quality data are used to evaluate supervisor and managerial performance.	1	2	3	4	5
Extent to which employees are recognized for superior quality performance.	1	2	3	4	5
Comprehensiveness of the goal-setting process for quality within the organization.	1	2	3	4	5
Availability of resources for employee training in the organization.	1	2	3	4	5
Clarity of specifications provided to suppliers.	1	2	3	4	5
Degree of automation of the process.	1	2	3	4	5
Extent to which quality data, control charts, etc., are displayed at employee work stations.	1	2	3	4	5
Effectiveness of supervisors in solving problems/issues.	1	2	3	4	5
Extent to which quality goals and policies are understood within the organization.	1	2	3	4	5

Extent or Degree of Current Practice Is
Very Low Low Medium High Very High

Extent to which process design is "fool-proof" and minimizes the chance of employee errors.	1	2	3	4	5
Importance attached to quality by top management in relation to cost and schedule objectives.	1	2	3	4	5
Clarity of work or process instructions given to employees.	1	2	3	4	5
Amount of review of quality issues in top management meetings.	1	2	3	4	5
Degree to which top management considers quality management as a way to increase productivity/ reduce costs.	1	2	3	4	5
Degree of comprehensiveness of the quality plan within the organization.	1	2	3	4	5
Extent of analysis of customer requirements in process/service development process.	1	2	3	4	5
Responsibility assumed by purchasing department for the quality of incoming products/services.	1	2	3	4	5
Extent to which suppliers have programs to assure quality of their products/service.	1	2	3	4	5
Use of statistical control charts to control processes.	1	2	3	4	5

Extent or Degree of Current Practice Is
 Very Low Low Medium High Very High

Importance of inspection,
 review, or checking of work.

1 2 3 4 5

Self-inspection of work
 by workers.

1 2 3 4 5

Extent of quality data
 collected by the
 organization.

1 2 3 4 5

Team building and group
 dynamics training for
 employees in the organization.

1 2 3 4 5

Extent to which quality is
 considered a marketable
 attribute.

1 2 3 4 5

Comments:

APPENDIX B (Point of Contact)

Individuals at each of the following organizations participated in the thesis survey. They were picked at random by the point of contact (POC). A POC is shown for each of the organizations as well as the name and title is listed for each of the organization's interviewee.

Naval Air Warfare Center
(Aircraft Division)
Indianapolis, Indiana
(POC Ms. Ruth Daughter
317-353-7070
A/V 369-7070)

Navy Aviation Supply Office
700 Robbins Ave
Philadelphia, PA. 19111-5098
(POC Mr. Marvin Sandler
215-679-1375
A/V 442-1375)

Fleet and Industrial Supply Center
973 North Harbor Drive
San Diego, CA 92132-5044
(POC Mr. Mike Stames
619-532-1689
A/V 522-1689)

APPENDIX C (Modified Survey)

(Not shown as mailed but arranged by factors)

Factor 1: Role of top management and quality policy	Mean
1. Extent to which the top executive assumes responsibility for quality performance.	3.3
2. Acceptance of responsibility for quality by major branch/department heads within the organization.	3.6
3. Degree to which top management (Commanding/executive officer and major department heads) is evaluated for quality performance.	2.9
4. Extent to which top management supports long-term improvement process.	3.4
5. Degree of participation by major department heads in the quality improvement process.	3.3
6. Extent to which top management has objectives for quality performance.	3.6
7. Specificity of quality goals within the organization.	3.1
8. Comprehensiveness of the goal-setting process for quality within the organization.	3.1
9. Extent to which quality goals and policies are understood within the organization.	3.0
10. Importance attached to quality top management in relation to cost and schedule objectives.	3.3
11. Amount of review of quality issues in top management meetings.	3.3

	<u>Mean</u>
12. Degree to which top management considers quality management a way to increase productivity and reduce costs.	3.7
13. Degree of comprehensiveness of the quality plan within the organization.	3.3
Factor 2: Role of the quality department	
14. Visibility of the quality department.	4.0
15. Quality department's access to top management.	4.6
16. Autonomy of the quality department.	4.0
18. Amount of coordination between the quality department and other departments.	3.7
19. Effectiveness of the quality department in improving quality.	3.2
Factor 3: Training	
20. Specific work-skills training (technical and vocational) given to non-supervised employees throughout the organization.	3.5
22. Quality-related training given to non-supervisory employees throughout the organization.	3.7
23. Quality-related training given to managers and supervisors throughout the organization.	4.0
24. Training in the "total quality concept" (i.e., philosophy of company-wide responsibility for quality) throughout the organization.	3.9

	<u>Mean</u>
26. Training in the basic histograms and control charts) in the organization as a whole.	3.4
27. Training in advanced statistical techniques (such as design of experiments and regression analysis) in the organization as a whole.	2.4
28. Commitment of top management to employee training.	3.7
29. Availability of resources for employee training in the organization.	3.5
Factor 4: Product/service design	
30. Thoroughness of new process/ service design reviews before the process/service is implemented and produced.	2.9
31. Coordination among affected departments in the process/service development process.	3.2
32. Extent to which new process/service emphasized in relation to cost or schedule objectives.	3.0
33. Extent of analysis of customer requirements in process/service development process.	3.5
34. Clarity of process/service specifications and procedures	3.2
35. Extent to which implementation/ producibility is considered in the process/service design process.	3.1
37. Quality emphasis by customer service, employees.	3.2

	<u>Mean</u>
Factor 5: Supplier quality management (supplier of goods and/or services)	
38. Extent to which suppliers are selected based on quality rather than price or schedule.	2.3
39. Thoroughness of the supplier rating system.	3.0
40. Reliance on reasonably few quality suppliers.	2.7
41. Extent to which organizations educate suppliers as to its quality requirements.	2.7
42. Technical assistance provided to the supplier.	3.3
43. Involvement of the supplier in the product development process.	3.1
44. Extent to which longer term relationships are offered to suppliers.	3.3
45. Clarity of specifications provided to suppliers.	3.1
46. Responsibility assumed by purchasing department for the quality of incoming products/services.	2.6
47. Extent to which suppliers have programs to assure quality of their products/service.	3.0
Factor 6: Process management/operating procedures	
48. Use of acceptance sampling to accept/reject lots or batches of work.	2.6
49. Use of statistical control charts to control processes.	2.7
51. Extent to which inspection, review or checking of work is automate	2.5

	<u>Mean</u>
52. Amount of incoming inspection, review, or checking.	3.0
53. Amount of in-process inspection, review, or checking.	3.3
54. Amount of final inspection, review, or checking.	3.6
55. Importance of inspection, review, or checking of work.	3.4
56. Self-inspection of work by workers.	3.4
57. Stability of production schedule/work distribution.	2.9
58. Degree of automation of the process.	3.4
59. Extent to which process design is "fool-proof" and minimizes the chance of employee errors.	2.6
60. Clarity of work or process instructions given to employees.	2.9
Factor 7: Quality data and reporting	
61. Availability of cost of quality data in the division.	2.1
62. Availability of quality data (error rates, defect rates, scrap, defects)	2.7
63. Timeliness of the quality data.	2.9
64. Extent of quality data collected by the organization.	2.9
65. Extent to which quality data (cost of quality, defects, errors, etc.) are used as tools to manage quality.	3.0

	<u>Mean</u>
66. Extent to which quality data are available to non-supervised employees.	2.8
67. Extent to which quality data are available to managers and supervisors.	3.2
68. Extent to which quality data are used to evaluate supervisor and managerial performance.	2.8
69. Extent to which quality data, control charts, etc., are displayed at employee work stations.	2.4
Factor 8: Employee relations	
70. Extent to which TQM/TQL implemented in the organization.	3.7
71. Effectiveness of TQM/TQL in the organization.	3.2
72. Extent to which employees are held responsible for error-free output.	2.8
73. Amount of feedback provided to employees on their quality performance.	3.0
74. Degree of participation in quality decisions by non-supervisory employees.	3.1
75. Extent to which quality improvements are viewed as ongoing responsibilities of all employees.	3.4
76. Extent to which employees are recognized for superior quality performance.	3.5
78. Effectiveness of supervisors in solving problems/issues.	3.3

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